NOAA SHIP McARTHUR

CRUISE REPORT

FARALLON ISLANDS DUMPSITE CONTAMINATION STUDY
AR-91-03

November 9-20, 1991

Farallon Islands, California

Prepared by:

Cheryl L. Callahan
Lt(jg), NOAA
Chief Scientist

Approved by:

Dr. Alec D. MacCall
Director, SWFSC -
Tiburon Laboratory

## 1.0 Cruise Description and Objectives:

Disposal of waste materials was conducted in the area now designated as the Gulf of the Farallones National Marine Sanctuary (GFNMS) off the California coast between approximately 1946 and 1970. Concerns have been raised from time to time that some of the containers, which may have contained radioactive and chemical wastes, have been leaking and may pose a hazard to human consumption of fish and shellfish. The dumpsite will be monitored in the near future to determine the likelihood of this possibility.

This cruise was designed to establish two reference areas in which no dumping has taken place, with three primary goals:

1. Develop and test traps for sampling benthic fish and shellfish,

2. Evaluate the ability to sample potential target species, and

3. Obtain specimens from reference stations to provide a baseline of contaminants and radionuclides from clean areas for later comparison with possibly contaminated areas.

## 2.0 OPERATIONAL SUMMARY

Two control stations or reference areas were established as planned. There were to be three target species - Dover sole, sablefish and thornyheads - but only sablefish were caught. At each station, two longlines, each with 100 hooks of several sizes, were to be deployed for varying soak times of 12-24 hours. And five lines of 10 traps were to be deployed for varying soak times of 1-5 days. All gear was deployed in 200-400 fathoms of water.

2.1 DEPLOYMENT: All gear was deployed over the fantail by first tossing over a 12-foot spar buoy, with a strobe light and radar reflector, a 9-inch trailer buoy and a 12-inch main buoy. This was then followed by 1.3 times the water depth of ⅝-inch polypropylene line. At approximately 25-100 fathoms of line, a 5-lb. (later increased to 20 lbs.) anchor was attached to the line to help hold down the "excess" line below the water's surface. At the end of the down line, a 20-lb. (later increased to 95 lbs. on the longlines) anchor was attached, along with the groundline. The hooks or traps were snapped onto the groundline as it was fed out (the groundline was wrapped around the capstan to help control the speed and to be able to stop it when needed). At the end of the groundline, another anchor, down line, and buoy system went out. Each deployment took approximately 20-30

system went out. Each deployment took approximately 20-30 minutes. Most deployments went smoothly, but there were a few minor problems (see Section 3, Problems and Solutions).

2.2 RETRIEVAL: All gear was retrieved on the starboard side at a break in the bulwarks, using a small radial arm davit that was welded to the deck. A grappling hook was used to snag the downwind spar buoy as the ship maneuvered around the buoy. The down line was fed through a trawl block on the davit, and fairled to the capstan. All line was then coiled into large plastic garbage cans as it came off the capstan. Due to the strong winds blowing the ship away from the gear, a heavy strain was put on the lines, thus making it virtually impossible to rotate the davit inboard to remove the anchors and traps. Instead, they were manually pulled aboard to be removed from the groundline.

2.3 SAMPLING: As the fish were brought aboard, all live fish to be used were to be kept in live tanks for holding; the remaining fish were thrown in fish baskets. Once all fish were aboard, the fish not being used were measured for length and thrown overboard. Using EPA standards, each fish that was used for analysis was sampled one at a time. They were measured for fork length, weighed, and had the otoliths removed and then subsamples of the skin, muscle, skeletal, and liver tissue were taken and frozen for later analysis. Ideally, three subsamples of each tissue were to be taken from each fish: one for radioisotopes, one for trace metals, and one for organics (see Table 1).

2.4 SEDIMENT SAMPLING: Four sediment samples were to be taken from both stations, using a large Soutar grab. Once the water drained from the grab, the top layer was scrapped off for our analysis, two small samples were taken for USGS analysis of sediment size, and the remaining sample was sieved through a ½-inch mesh to look for invertebrates. The invertebrates were placed in 10% formalin for later identification.

2.5 STATION #1: All five traplines were deployed along with the two longlines. The first trapline was recovered and was a success, catching 68 sablefish (soak time of 24 hours). The other four traplines were not recovered (see Section 3, Problems and Solutions). The two longlines were not as successful, mainly due to their soak times, 63 hours and 25.6 hours (see Section 3, Problems and Solutions). The total sablefish catch was 7 and 42 respectfully. The 7 on the first longline were all dead (mainly consisting of only heads). Of the 42 sablefish caught on the second line, 28 were dead and 5 fell off the line before they were brought aboard. For total catch of all traps and lines, see Table 2. Five fish were used for analysis from the traps and 3 fish from the longlines were used.

2.5.1 One sediment sample was taken from Station #1. Initially, weather did not permit bottom sampling, but on the last day of the project, weather improved enough to use the Soutar grab (see Section 3, Problems and Solutions).

2.6 STATION #2: Two longlines were deployed and recovered (soak times of 4.5 hours and 7 hours). The first longline was fairly successful, containing 25 sablefish (22 live, 1 dead, and 2 that fell off the line as they were being brought aboard). The second longline's groundline parted in two sometime during the soak time or retrieval, and contained 5 dead sablefish (see Section 3, Problems and Solutions).

2.6.1 Two sediment samples were taken from Station #2.

## 3.0 PROBLEMS AND SOLUTIONS

3.1 LOSS OF GEAR: Loss of gear at Station #1 was by far the biggest problem encountered. As mentioned in Section 2, Operational Summary, all five lines of traps and the two longlines were set here.

3.1.1 The first longline was deployed on the afternoon of November 9, to be retrieved the next morning. When it was found, it had drifted over three miles in 36 hours.

3.1.2 The second longline was set with an additional 75 lbs. of weight on each end in hope that it would keep the line from drifting. This obviously did not work, since the gear was found two miles from it's deployment site.

3.1.3 The lines of traps each contained 9 or 10 traps per line, and each trap weighed in excess of 35 lbs. With this knowledge, it was felt that the traps would not drift appreciatively. After a 25-hour soak, the first set of traps showed that there was very little drift. The remaining sets of traps were not recovered. A search pattern and lookout watch rotation were set up after a couple of passes over the deployment site of the second and third sets. The search pattern encompassed an area of approximately one mile south and three miles in all other directions over the entire working grounds. The search was called off after 2 1/2 days due to the deteriorating weather and sea conditions. Even when the weather was better, the traps were not found.

3.1.4 Solutions:

3.1.4.1 One solution to losing the gear could be to set fewer lines and keep them visible at all times. There were periods of time when the ship would be over seven miles away from the nearest set, and with the wave height we were experiencing, we needed to be within a 1.0-1.5 nm range.

3.1.4.2 We found that the radar reflector was virtually useless in high seas and that the signal flag was too small to see at a great distance. A radio beacon could be placed on the spar buoy, and with a radio direction finder, the gear be tracked at all times. As far as the signal flag, a larger one could be placed on the spar buoy, which was done with the last few sets.

3.1.4.3 Another solution could be to have shorter soak times. We did find out that we got plenty of good specimens in the traps only after 24 hours, and on the longlines only after 4.5 hours. The soak times for the traps could even be shorter.

3.1.4.4 One final solution to the lost gear could be to use a different anchoring system. Heavy chain was used as anchors, which obviously didn't work very well, considering at one point one of the chains was polished clean as it was being dragged over the bottom.

3.2 DEPLOYMENT

3.2.1 Deployment from the fantail went fairly well. The main problem was lack of space. The ideal way to deploy the traps is to have them already snapped on to the line before putting anything over. It would take less people to deploy and would be safer. The deck space on the McARTHUR is not sufficient for this. As it was, the traps were stacked on top of each other and had to be manually pulled onto the deck as space was available, and then snapped on to the line as it was fed out.

3.2.2 As far as deploying the longline, there is enough space, but there were problems once we added the additional weight. Once 95 lbs. went over the side, it put a lot of strain on the groundline, pulling the line down to the deck, thus making it very difficult to snap on the leaders. In addition, the weight increased the difficulty of slowing/stopping the line in order to snap on the leader. This is where one scientist was hurt (fish hook in finger). While the crew was rigging up a block to run the groundline through, in order to get it off the deck, the line ran across the lip on the fantail and was chafed in half. After recovery of the spar buoy, redeployment of the longline went smoothly with the groundline running through the block.

3.2.3 Solutions:

3.2.3.1 The only solution to the deck space would be to use a different ship. The McARTHUR's fantail is rather small, and is not set up for fishing.

3.2.3.2 The problems with deployment of the longline was partially solved by using a snatch block. There was still a lot of strain on the line; hopefully, using a different anchoring system will help here too. By using a different anchor, the weight may not be as much, thus reducing the strain on the line.

3.2.3.3 Another possible solution to deploying the longline with the extra weight is to add a temporary float to the weight, e.g., a lifesaver with a detachment mechanism.

3.3 RETRIEVAL: The entire retrieval process was slow. Each retrieval took over 2½ hours when you add the ship's maneuvering time and the grappling of the spar buoy time to the actual hauling in of the lines.

3.3.1 The biggest problem with the retrieval was the heavy strain on the lines as they were hauled in. The strain was caused by having the retrieval on the windward side, thus pushing us off the gear. Ideally, the ship should be able to drift over the line so that the line is vertical in the water column. This causes less strain and makes retrieval easier. The McARTHUR is not set up to do this type of fishing. The screws are only a couple of feet abaft the opening in the bulwark, which means drifting over the line could cause problems. The weather also played a major role in the heavy strain.

3.3.2 The heavy strain also caused the pin in the radial arm davit to bend. A chain backstay was placed on the davit as temporary support. This caused problems when the anchors and traps came up. They had to be hauled in manually rather than by swinging in the davit.

3.3.3 Solutions:

3.3.3.1 A line hauler and coiler could be used to speed up the hauling in of the line.

3.3.3.2 The heavy strain is hard to overcome with the McARTHUR. Of course, with less wind and seas, there would not have been as heavy a strain, but there would still be strain due to the ship being pushed away from the line.

3.3.3.3 A chain backstay and a heavier steel pin were used as temporary support on the davit. A more permanent device must be made to add more support and still allow the arm to swing inboard.

## 3.4 SEDIMENT SAMPLING

3.4.1 The biggest problem with sediment sampling was the weather. Generally, the weather was too rough to deploy and retrieve the large Soutar grab. The small Van Veen was just too light to work at the depths we needed. When we did get a chance to deploy, the grab came up at least 80% full with undisturbed material.

3.4.2 The only other problem with sediment sampling was that the Braden winch started to have problems, and we were unable to acquire any more sediment.

## 3.5 WEATHER

3.5.1 The weather caused many problems as already stated above. Two days were entirely lost due to heavy seas and high winds. There were a few days that even if we had found the lost gear, the weather was at such a state that we would not have been able to retrieve it.

# 4.0 DISPOSITION OF DATA and SAMPLES

## 4.1 DATA

4.1.1 Biological and Sediment Collection Data -
Cheryl Callahan
SWFSC/NMFS
3150 Paradise Dr.
Tiburon, CA 94920

4.1.2 Sediment size -
Norman Maher
USGS

## 4.2 SAMPLES FOR ANALYSIS

4.2.1 Radionuclide analysis -
Dr. John Broadway
US EPA/NAREL
1504 Ave. A
Montgomery, AL 35115-2601

4.2.2 Trace Metals and Organics analysis -
Dr. Sin-Lam Chan
Environmental Conservation Division
NWFSC/NMFS
2725 Montlake Blvd. E.
Seattle, WA 989112

## 5.0 PARTICIPATING SCIENTISTS

| Name | Title | Sex | Nat. | Affil. |
|---|---|---|---|---|
| 1.Cheryl Callahan | Oceanographer | F | USA | NMFS |
| 2.Tom Jow | Marine Biologist | M | USA | GFNMS |
| 3.Norman Maher | Geologist | M | USA | USGS |
| 4.Donald MacDonald | Oceanographer | M | USA | HAZMAT |
| 5.Jan Roletto | Research Coordinator | F | USA | GFNMS |
| 6.Joan Walsh | Biologist | F | USA | PRBO |

Table 1. Sablefish tissue samples taken for analysis from the Farallon Islands Radioactive Waste Dump Control Study. R = radioisotopes; O = organics; T = trace metals.

| Fish # | Muscle | | | Skin | | | Bone | | | Liver | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | O | T | R | O | T | R | O | T | R | O | T |
| **SITE #1 - TRAPLINE** | | | | | | | | | | | | |
| 1 | X | X | | X | | | X | | | X | | |
| 2 | X | X | X | | X | | X | X | X | X | X | X |
| 3 | SNAILS | | | SNAILS | | | SNAILS | | | SNAILS | | |
| 4 | X | X | X | X | | X | | X | X | | X | X |
| 5 | X | | | | | | X | X | X | | | |
| **SITE #1 - LONGLINE #2** | | | | | | | | | | | | |
| 6,7,8 | X | X | | X | X | X | X | X | X | X | X | X |
| **SITE #2 - LONGLINE #1** | | | | | | | | | | | | |
| 9 | X | | | X | | | X | | | X | | |
| 10 | X | | | X | | | X | | | X | | |
| 11 | X | | | X | | X | X | | | X | | |
| 12 | | | | | X | | | X | | | X | |
| 13 | | | X | | | X | | | | | | X |
| 14 | X | | | X | | | X | | X | X | | |
| 15 | | X | | | X | | | X | | | X | |
| 16 | | | X | | | | | | | | | X |
| 17 | X | | | X | | | X | | | X | | |
| Totals | $\overline{10}$ | $\overline{5}$ | $\overline{4}$ | $\overline{8}$ | $\overline{4}$ | $\overline{4}$ | $\overline{9}$ | $\overline{6}$ | $\overline{5}$ | $\overline{8}$ | $\overline{5}$ | $\overline{5}$ |

Table 2. Total fish catch from the Farallon Islands Radioactive Waste Dump Control Study.

| | STATION #1 | | | STATION #2 | |
|---|---|---|---|---|---|
| | Long-line 1 | Long-line 2 | Trap-line 1 | Long-line 1 | Long-line 2 |
| Sablefish | 7 | 42 | 68 | 25 | 5 |
| Hagfish | | | 67 | | |
| Brown cat shark | | 4 | | | |
| Spiny dogfish | 1 | | | | |
| Sandpaper skate | 1 | 1 | | | |
| California skate | 1 | | | | |
| Splitnose rockfish | | | | 1 | |
| Blackgill rockfish | | | | | 1 |
| Longspine thornyhead | 1 | | | | |
| Unknown | | | | | 1 |
| Total | 10 | 48 | 135 | 26 | 7 |